

Background material for presentation on Other Process Research (Ocean Acidification, Loss of Sea Ice)

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“Other” process oriented research projects at the Alaska Fisheries Science Center include:

- 1) Ocean Acidification (Foy and Hurst et al.)
- 2) Loss of Sea Ice (Sigler et al.)

Ocean Acidification

As carbon dioxide levels in the atmosphere increase, the oceans absorb larger amounts of this gas creating a chemical reaction that increases carbonate ions. In turn, the increased carbonate ions in the ocean impede calcification in marine organisms. The Alaska Fisheries Science Center has focused on this issue attempting to understand how ocean acidification will impact commercial fish and shellfish species, their prey, and habitat (i.e. coral). The strategy to obtain data has been to run laboratory experiments to assess physiological response of commercial crab species such as red, blue, and golden king crab, Tanner crab, and snow crab, commercial fish species such as walleye pollock and northern rock sole as well as potential fish habitat such as red tree coral to increased ocean acidification. The response variables for crab included survival, growth, calcification, shell mechanics, hemocyte function, respiration, and gene expression. For fishes they included, growth behavior and sensory response. For fish habitat the response variable was reproductive development.

Data were analyzed and results were used to inform stock assessment and bioeconomic models to estimate population level and coastal community impacts in Alaska. These data were published in at least 12 peer reviewed publications, are maintained at the Alaska Fisheries Science Center, and have met PARR requirements.

Loss of Sea Ice

Declining seasonal sea ice in the Bering Sea and Chukchi Sea is having an impact on marine ecosystems. Integrated ecosystem research (physics to fish) during late summer in the eastern Bering Sea was conducted annually from 2000 to 2012 to gain a mechanistic understanding of climate change and variability on ecosystem function and fish survival. These surveys are now conducted biennially (even years). Integrated ecosystem surveys in the Chukchi Sea are conducted sporadically depending on funding. Data collected during the surveys are published in peer reviewed journals are housed within the AFSC and meet the PARR requirements. These data are used to understand the impact of climate change and variability on Living Marine Resources. The examples given in the presentation include winners and losers of potentially commercial fishes including Arctic cod and saffron cod in the Chukchi Sea and movement of commercially important subarctic fishes north into the Arctic as seasonal sea ice declines and ocean temperatures warm.